REMARKS

In the Office Action of September 10, 2002, Claims 15 - 27 were rejected. No claim was allowed. In response, Claims 18 and 23 are amended. Reexamination and reconsideration are respectfully requested in view of the foregoing amendments and the following remarks.

Rejection of Claims 18 - 27 under 35 U.S.C. 112, first paragraph

Claims 18 - 27 were rejected under 35 U.S.C. 112, first paragraph, on the alleged grounds that the limitation "forming an element-separating oxide film on the silicon substrate in the element separating area after removing at least another part of the oxidation-preventing film" was not disclosed in the specification as originally filed.

In response, independent Claims 18 and 23 are amended to replace the phrase "at least another part" with --the--. This amendment brings the language of this portion of Claims 18 and 23 into conformity with the description, for example, of Example 1 of the specification, thereby overcoming the rejection of Claims 18 - 27 under 35 U.S.C. 112, first paragraph. Entry of the above amendments is therefore respectfully requested.

Rejection of Claim 15 - 17 under 35 U.S.C. §103(a) over Kunikiyo in view of Chiu et al

Claims 15 - 17 were rejected under 35 U.S.C. §103(a) as obvious over Kunikiyo (U.S. Patent No. 5,668,403) in view of Chiu et al (U.S. Patent No. 5,470,783). The Office Action alleges that Kunikiyo teaches a process for producing

a semiconductor device that comprises the steps of: forming an element isolation oxide film on a silicon substrate by thermal oxidation using a nitride film as a mask; removing the nitride mask and thereafter carrying out a heat-treatment at a temperature of 950 °C or more in a nitrogen atmosphere to relax stress in the isolation oxide film; and forming a gate oxide film, a source and a drain, electrode and wiring, and an insulating film so as to form a transistor.

The Examiner states that Kunikiyo differs from the claims in not disclosing that the thermal oxidation is carried out at the claimed temperature of 850 °C in an atmosphere of a gaseous mixture of hydrogen and oxygen or in an atmosphere of H_2O. However, the Examiner alleges that Chiu teaches that a field oxide is grown in a conventional wet oxidation environment of $H_2O + O_2$ or $H_2 + O_2$ at a nominal temperature of about 800 °C to about 1000 °C. The Examiner takes the position that it would have been obvious to one having ordinary skill in the art at the time the invention was made to carry out the thermal oxidation of Kunikiyo under the condition taught by Chiu because such thermal process for forming the field oxide is conventional in the art, and the application of a known process to make the same would have been within the level of an artisan. The Examiner further alleges that the functional limitation of reducing stress in the oxide film to substantially zero recited in claim 12 is inherent in that the heat-treatment of Kunikiyo would produce the same result because Kunikiyo performs the heat-treatment under the same condition with that of the claim.

This rejection is respectfully traversed. The process of the present invention comprises depositing a silicon nitride film on a substrate, forming a LOCOS (element separating oxide film), removing the deposited silicon nitride film, and conducting

thermal treatment on the region of the substrate from which the silicon nitride is removed, said region of substrate having a silicon oxide film thereon. The process includes an embodiment of a part of Example 1 wherein the pad oxide film is retained at the time of forming the pad oxide film on the substrate by thermal oxidation of the substrate before forming the silicon nitride film, and Example 2 wherein a thermal oxide film is formed on the substrate after formation of LOCOS.

In Kunikiyo, on the other hand, it is only disclosed that after forming a LOCOS oxide film, the nitride film 3 and the underlying oxide film 2 around the LOCOS are removed to expose the substrate 1, followed by heat treatment in a nitrogen atmosphere. Kunikiyo does not disclose that a high temperature heat treatment is conducted while the substrate around the element isolation region is covered with an oxide film as in the present invention.

When the heat treatment is conducted in a nitrogen atmosphere after forming the element isolation region, and exposing the substrate after removing the surface oxide film there around as taught by Kunikiyo, the exposed substrate surface is subjected to formation of thin nitride film, which would have to be removed before subsequent steps such as the formation of a gate insulating film, are carried out.

On the other hand, when the heat treatment is conducted wherein the substrate around the element isolation region is covered with an oxide film as in the present invention, even if the heat treatment is conducted in a nitrogen atmosphere, the formation of a thin nitride film requiring removal, such as would be produced according to the process of Kunikiyo, can be avoided. Thus, the present invention provides a more efficient production process than that shown in Kunikiyo.

Even if Kunikiyo is combined with Chiu et al, the process of the present invention cannot be obtained. Chui relates to details of growing a field oxide, and does not teach or suggest a subsequent heat treatment in an inert atmosphere to relax stress. The combination of Kunikiyo and Chiu does not teach or suggest a process wherein a heat treatment is carried out on a portion of a substrate having a oxide film thereon after removal of an oxidation-preventing film.

Accordingly, it is respectfully submitted that the combination of Kunikiyo and Chui do not teach or suggest the present invention and that Claims 15 - 17 would not have been obvious over Kunikiyo and Chui, alone or in combination.

Rejection of Claim 15 - 17 under the Judicially Created Doctrine of Obviousness-type Double Patenting

Claims 15 - 17 were rejected under the judicially created doctrine of obviousness-type double patenting over Claims 2 and 5 of U.S. Patent No. 6,326,284 in view of Chui et al.

In response, a terminal disclaimer in compliance with 37 CFR 1.321(c) is submitted herewith. Accordingly, it is respectfully submitted that the rejection of Claims 15 - 17 for obviousness-type double patenting is thereby overcome.

Conclusion

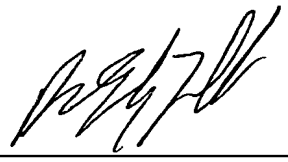
In view of the foregoing amendments and remarks, it is respectfully submitted that Claims 15 - 27 are in condition for allowance. Favorable reconsideration is respectfully requested.

Should the Examiner believe that anything further is necessary to place this

application in condition for allowance, the Examiner is requested to contact applicants' undersigned attorney at the telephone number listed below.

Kindly charge any additional fees due, or credit overpayment of fees, to Deposit Account No. 01-2135 (500.34397CV2).

Respectfully submitted,
ANTONELLI, TERRY, STOUT & KRAUS



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IN THE CLAIMS

18. (amended) A process for producing a semiconductor device, which comprises the steps of:

oxidizing a main surface of a silicon substrate,

forming an oxidation-preventing film on portions of the oxidized silicon substrate,

removing a part of the oxidation-preventing film that is located in an element-separating area,

forming an element-separating oxide film on the silicon substrate in the element-separating area after removing ~~at least another~~ the part of the oxidation-preventing film,

forming a thermal oxide film on the silicon substrate by oxidizing the silicon substrate, and

after forming the thermal oxide film, carrying out a heat-treatment at a temperature of 800° C or higher in an inert atmosphere, and

which further comprises forming a gate oxide film over the heat-treated silicon substrate.

23. (amended) A process for producing a semiconductor device, which comprises the steps of:

oxidizing a main surface of a silicon substrate,

forming an oxidation-preventing film on portions of the oxidized silicon

substrate,

removing a part of the oxidation-preventing film that is located in an element-separating area,

forming an element-separating oxide film on the silicon substrate in the element-separating area after removing ~~at least another~~ the part of the oxidation-preventing film,

forming a thermal oxide film on the silicon substrate by oxidizing the silicon substrate,

forming a gate electrode film on the thermal oxide film, and

after forming the gate electrode film, carrying out a heat-treatment at a temperature of 800°C or higher in an inert atmosphere.